3.0 RIDERSHIP AND REVENUE

3.1 Current and Future Intercity Travel Markets

The market for intercity travel in California that the high-speed train system can serve is projected to grow by almost 40 percent over the next 20 years while the corresponding population increase is 36 percent. By the year 2020, the high-speed train system is forecast to carry 32 million intercity passengers and generate $888 million in revenue (in 1999 dollars). This revenue will more than cover operating costs, resulting in an annual surplus of nearly $340 million. However, these estimates are based upon current costs, travel times and congestion levels of air and automobile transportation. Sensitivity analyses using assumptions of increased costs and congestion of air and automobile travel resulted in revenue from intercity high-speed train passengers up to nearly twice as high (over $1.7 billion for 2020). In addition, by 2020, the system is forecast to carry nearly 38,000 commuters every weekday or about 10 million commute passengers per year. Commuters traveling on intercity trains are expected to yield a modest additional revenue surplus and significantly increase the benefits of a high-speed train system.

The intercity patronage and revenue forecasts presented in this chapter are of investment quality and represent the best estimates possible at this stage of planning. The forecasts were developed using state-of-the-art techniques and rely on extensive survey market research conducted in California specifically for this purpose.

Current Intercity Travel

Californians currently make over 154 million annual trips between the major metropolitan regions of Northern and Southern California and regions in between. These are intercity trips made between regions as distinguished from regular commute trips to the place of work. Over 42 million of these trips are for journeys at least 150 miles long.

The automobile currently dominates intercity travel. In 1997, Californians took to the highways for over 88 percent of these intercity trips and flew for just over 10 percent of all trips. However, air is preferred for a greater proportion of longer intercity trips, serving well over a third of those trips longer than 150 miles. Only a relatively very small number of Californians made their intercity trips by existing conventional passenger rail.

Much of intercity travel in California is for trips of intermediate distance. These include over 54 million intercity trips made between the Central Valley and other major metropolitan areas, accounting for over a third of the intercity travel. Travel between the Los Angeles and San Diego regions forms the second largest geographic market with over 36 million trips. Travel between Sacramento and San Francisco represents the third largest intercity travel market in the state at over 21 million annual trips. Another key geographic market is that between the Los Angeles and San Francisco regions. This market coincides

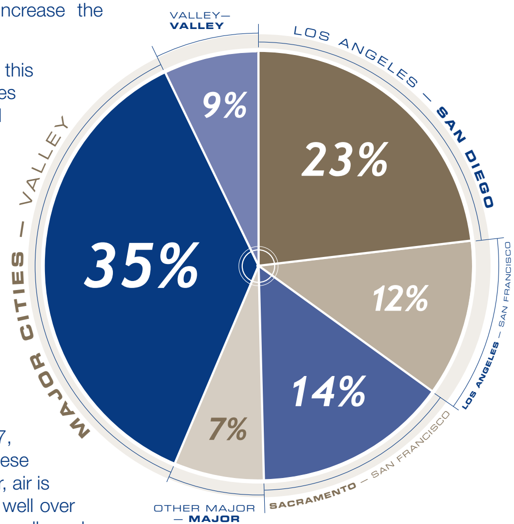


Figure 3.1
Current Intercity Travel by Geographic Market

with the busiest air route in the United States, if not the world. The 17.8 million trips between the Los Angeles and San Francisco regions represent 23 percent of all intercity trips *(Figure 3.1)*.

Intercity Travel in 2020

By the year 2020 the intercity travel market considered by this study will grow to almost 215 million trips. Almost 61 million of these trips will be at least 150 miles long. Without high-speed trains, almost 15 percent of all intercity travel and over 40 percent of the longer trips will be made by air. Auto trips will account for over 84 percent of all intercity travel and over 58 percent of the longer trips.

3.2 Intercity Patronage and Revenue Forecasts

The high-speed train network envisioned for California will provide a highly attractive option for intercity travel, and should result in robust ridership and a surplus in operating revenue. With 86 intercity trains per day in both directions, the high-speed train system is forecast to attract over 32 million intercity passengers and generate over $888 million by the year 2020.

Ridership and Revenue by Trip Purpose

About 38 percent of the high-speed train passengers are estimated to be traveling on business. These business travelers are forecast to account for a disproportionate share of the revenue (52 percent), reflecting the higher average fares paid. The remainder of the passengers, accounting for about 62 percent of the ridership and 48 percent of the revenue, are estimated to be traveling for non-business purposes *(Table 3.1)*.

	Ridership		Revenue	
	(MILLIONS)	(PERCENT)	(MILLIONS $1999)	(PERCENT)
Business	12.2	38%	$465	52%
Non-business	19.8	62%	$423	48%
TOTAL	32.0	100%	$888	100%

Table 3.1
Intercity High-Speed Train Ridership and Revenue by Trip Purpose for 2020

Ridership and Revenue by Geographic Market

Table 3.2 summarizes the system ridership and revenue by geographic market. These markets include trips between the Los Angeles and San Francisco metropolitan regions (e.g., San Jose to Santa Clarita), trips made between either Los Angeles or San Francisco and the Central Valley (e.g., Los Angeles to Bakersfield), trips made within the Central Valley (e.g., Fresno to Bakersfield), trips between other major metropolitan regions (e.g., Sacramento to Los Angeles), and other trips (e.g., Sacramento to San Diego). Trips between the San Francisco and Los Angeles regions are estimated to account for the largest portion of system ridership (35 percent) and revenue (39 percent). The next largest contributions to ridership and revenue are forecast to come from trips between the Los Angeles or San Francisco regions and the Central Valley (17 percent of ridership) and between the San Diego and Los Angeles regions (17 percent of ridership).

Most passengers are forecasted to board or disembark from the high-speed train system at one of the major metropolitan stations. With its numerous multi-modal connections, Los Angeles Union Station is estimated to be the busiest station with 9 million total annual boardings and alightings followed by the San Francisco, Sacramento, and San Diego stations *(Figure 3.2)*. Total boardings and alightings equal twice the number of passenger trips, since each high-speed train trip requires a passenger to both board and alight.

Ridership and Revenue by Source

As shown in *Table 3.3*, most of the high-speed train riders will be diverted from air and the private auto. About 45 percent of the ridership will be diverted from air transportation and another 42 percent from the private auto. However, because airline passengers travel longer distances on average than auto travelers, have a greater tendency to be business travelers, value their time more highly, and pay higher fares than auto travelers, trips diverted from air will account for over half the system revenue.

The high-speed trains will also induce travel; that is, some people who would not otherwise make trips will now do so because of the availability of high-speed rail. These two million new passengers will account for about 6 percent of the ridership and 5 percent of the revenue.

	Ridership (MILLIONS)	Ridership (PERCENT)	Revenue (MILLIONS $1999)	Revenue (PERCENT)
L.A. Region - S.F. Bay Area	11.2	35	347	39
L.A. Region / S.F. Bay Area - Valley	5.3	16	125	14
Valley - Valley	0.8	2	18	2
Sacramento - L.A. Region	3.4	11	104	12
Sacramento - S.F. Bay Area	1.7	5	41	5
San Diego - L.A. Region	5.3	17	125	14
San Diego - S.F. Bay Area	2.3	7	74	8
Other	2.1	7	55	6
TOTAL	32.0	100	$888	100

Table 3.2
Intercity High-Speed Train Ridership and Revenue by Origin-Destination Regional Market Segment for 2020

	Ridership (MILLIONS)	Ridership (PERCENT)	Revenue (MILLIONS $1999)	Revenue (PERCENT)
Local Air	14.4	45	464	52
Connect Air	0.3	1	6	1
Conventional Rail	1.9	6	41	5
Private Vehicle	13.4	42	331	37
Subtotal	30.0	94	842	95
Induced Travel	2.0	6	46	5
TOTAL	32.0	100	$888	100

Table 3.3
Total Intercity High-Speed Train Ridership and Passenger Revenue in 2020 by Source

Mode Share with High-Speed Trains in 2020

High-speed trains will compete with existing modes of transportation, providing an attractive option for certain kinds of trips but not for others. In this regard, there are three categories of automobile trips:

- En route captive — these are auto trips that require stops to be made en route. Such trips are not considered candidates for diversion to high-speed trains.
- Destination captive — these are auto trips that require a private vehicle at the destination. The value of the perceived inconvenience and cost of renting a car at the destination is included when comparing high-speed trains to auto travel for this category of trips.
- Noncaptive — these are trips made by auto that neither require a vehicle at the destination nor stops en route. These trips are candidates for diversion to high-speed trains with no penalty associated with renting a car at the destination.

With respect to air travel, the high-speed train system will compete for two types of trips:

- Local air traffic — these are trips made by air within the state (between for example, Los Angeles and San Francisco, Burbank and Oakland, San Diego and Sacramento). All local air trips are considered candidates for diversion to high-speed trains.
- Connecting air traffic — these are cross-country or international trips made by air from San Francisco International Airport (SFO), the only hub airport assumed to have a direct high-speed train connection in these ridership forecasts. Connecting air trips originate from or have a final destination in areas outside the immediate vicinity of the airport. Examples of connecting air traffic that could be served by high-speed trains would be portions of trips from Fresno to New York City and from

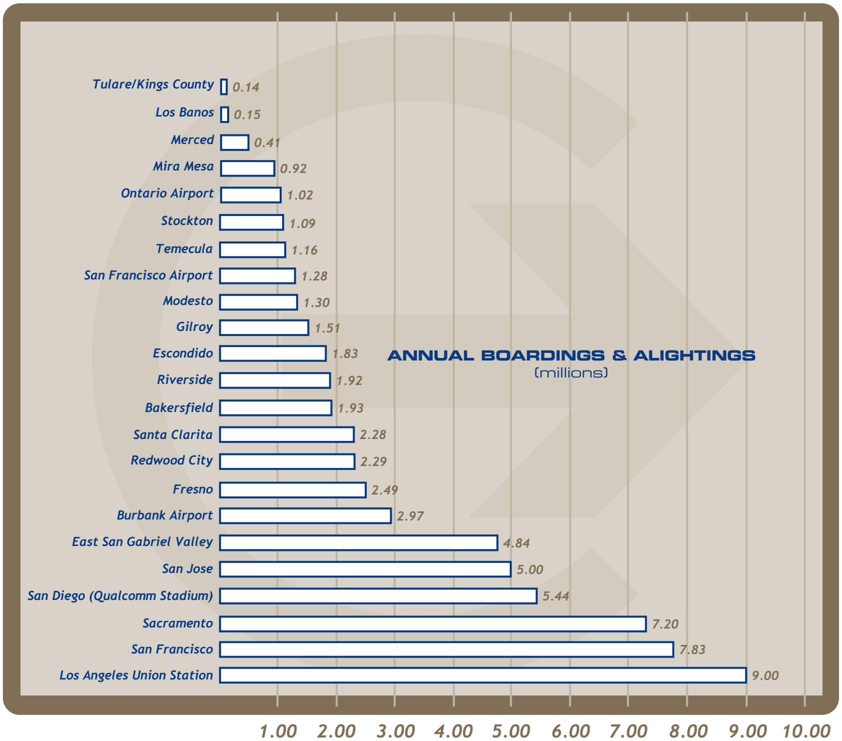


Figure 3.2
Total Boardings and Alightings by Station in 2020

Stockton to Tokyo via SFO, where travel to or from the airport is considered a candidate for diversion to high-speed trains.

Figure 3.3 shows the projected shares of total intercity travel by mode with high-speed trains. *Figure 3.4* presents the same information but only includes trips of at least 150 miles. The portion of intercity travel high-speed trains will capture varies by geographic market *(Figure 3.5)*. The private auto will continue to serve the majority of shorter distance trips, such as between the San Francisco and Sacramento regions. For the longest journeys, such as between Sacramento and San Diego, high-speed trains will split most of the market with air. In markets without frequent low-cost air service, such as between Fresno and San Francisco or Los Angeles, high-speed trains will play a key intercity transportation role alongside the private auto.

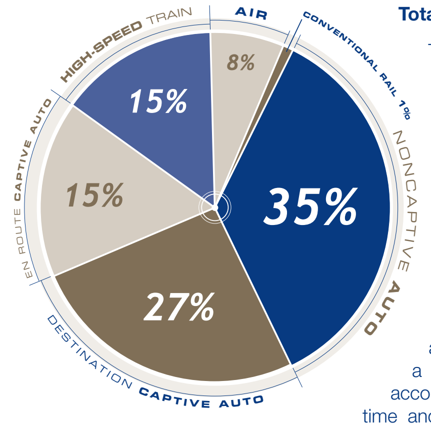
The availability of high-speed train service will divert over half of the trips within California that would have otherwise been made by air in the year 2020 *(Table 3.4)*. However, only 7 percent of the previously existing auto trips will be diverted. Nonetheless, intercity trips diverted from auto will account for over 13 million high-speed train passengers and $331 million in revenue in the year 2020 *(Table 3.3)*.

High-Speed Train Service Characteristics

When selecting a means of travel, people consider a number of factors including the fare, frequency of service, and door-to-door travel times as well as characteristics such as reliability, safety, and amenities. The following sections compare the proposed high-speed train service to other modes of transportation for some of these key service characteristics.

High-speed train service will divert over half of the trips within California that would have otherwise been made by air in the year 2020.

Figure 3.3
Intercity Travel Market Share with High-Speed Trains in 2020



Total Travel Time

Total travel time includes the time required to reach a station or airport; time spent waiting for the next scheduled flight or train (waiting time is a proxy for service frequency — less frequent service is reflected by more time waiting); time spent getting to the train tracks or airport gate; time spent checking in or retrieving baggage; time spent on the road, in the air, or on a train; and, the time needed to reach a final destination. Taking into account all these components of travel time and service frequency, high-speed trains will compare favorably to other modes. *Figure 3.6* illustrates typical total travel times for auto, air and high-speed trains.

The total travel times reported here reflect the conceptual high-speed train operating scenario[1]: a total of 86 trains per day in each of the northbound and southbound directions, with a mixture of express, suburban express, semi-express, local trains, and regional trains. Frequencies for air transportation were based upon current airline

[1] See Chapter 2 for full description

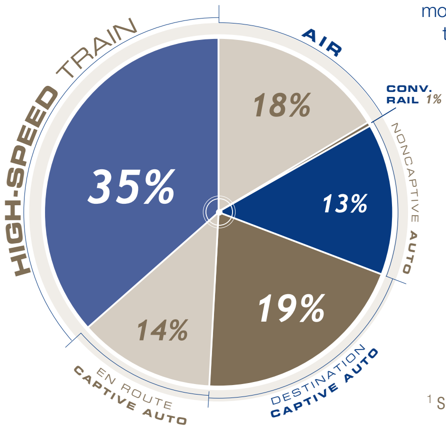


Figure 3.4
Intercity Travel Market Shares With High-Speed Trains in 2020 – Trips Over 150 Miles

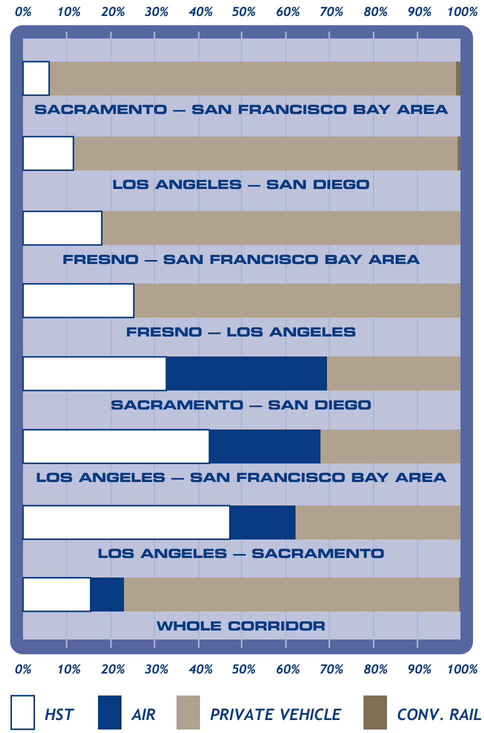


Figure 3.5
Mode Shares by Geographic Market for 2020 (Percent of Intercity trips between regions)

In regions without frequent low-cost air service, high-speed trains will play a key intercity transportation role alongside the private auto.

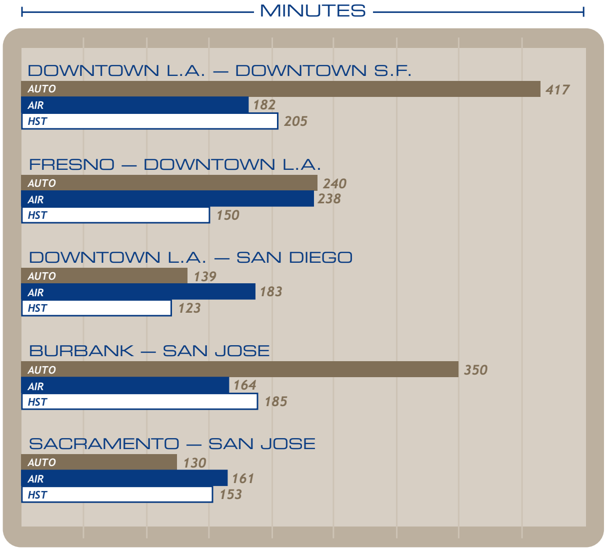


Figure 3.6
Sample Average Total Travel Times by Mode

schedules. Automobile travelers may use their vehicles at any time, therefore there is no waiting time associated with automobile travel.

Fares

The high-speed train system will generate surplus revenue with fares significantly lower than current airfares. A number of alternative high-speed train fare structures were tested to evaluate the sensitivity of ridership and revenue to higher or lower fares. Alternative high-speed fare structures were characterized by comparing the high-speed train fare with the comparable airfare for travel between Los Angeles and San Francisco.

The revenue maximizing fare for the high-speed train system is between 70 and 80 percent of L.A.-S.F. airfare. With fares above 80 percent of the L.A.-S.F. airfare, high-speed train revenues slowly begin to decline, while high-speed train ridership declines at a much greater rate. For example, a fare policy based upon 110 percent of the L.A.-S.F. airfare, is estimated to produce only about 18 million annual intercity riders, while the revenue from passengers remains relatively constant — at nearly $900 million a year. With fares below 70 to 80 percent of the L.A.-S.F. airfare, high-speed train revenues also slowly decline.

MODE	Percent of Intercity Trips Diverted
Local Air	56
Connect Air	5
Conventional Rail	71
Private Vehicle	7
All Trips	14

Table 3.4
Percent Diversion by Mode to HST by 2020

However, the high-speed train ridership increases at a much greater rate. There is a tradeoff between system ridership and system revenue. That is, a lower fare produces more ridership, but less revenue.

The high-speed train fare structure selected for the funding scenario was set to maximize ridership (i.e., user benefits) while still maintaining a healthy operating surplus. Under the selected fare structure, high-speed train fares are about 50 percent of the comparable airfare for travel between San Francisco and Los Angeles. This means the high-speed train fare is much less proportionately than the comparable airfare in most other markets (e.g., Fresno to San Francisco). *Table 3.5* provides a sample of high-speed train fares assumed for intercity travel. These were calculated as the sum of a $20 boarding charge plus an additional fare per mile.

The survey market research conducted for this study showed that business air travelers paid fares about 27 percent greater than the average fare paid by all travelers, while non-business travelers paid fares that averaged only 71 percent of the overall average fare. The high-speed train fares were therefore adjusted accordingly, resulting in different high-speed train fares for business and non-business passengers. These fares were then combined with the estimated costs of traveling to and from the terminals (parking, taxi fares, etc.), to produce the total travel costs used in the ridership and revenue forecasting process. *Table 3.6* illustrates some sample total (door-to-door) costs for travel between different city pairs.

Quality of Service Characteristics

Service characteristics such as comfort, perceived safety, privacy, productivity and reliability also influence people's decisions about how to travel. The mode choice models used to produce these forecasts incorporate the influence of these service characteristics in addition to the more easily measured travel time, fare, and frequency characteristics. The travel survey data collected for this project show that when travel times and costs are equal, air and conventional rail passengers believe high-speed trains will be a significantly more attractive travel option in California than those existing modes.

High-Speed Train Ridership and Revenue Over Time

Ridership and revenue for the high-speed train system will continue to grow as the system matures and California's population continues to grow. By the year 2050 both ridership and revenue in constant 1999 dollars is forecast to increase by about half over 2020 levels to over 47 million passengers and $1.3 billion in fare revenue.

	Business / Non-Business		
	Air	High-Speed Trains	Auto
Downtown Los Angeles - Downtown San Francisco	$135/$81	$54/$32	$44/$22
Merced - Downtown San Francisco	$232/$132	$43/$26	$15/$7
Fresno - Downtown Los Angeles	$177/$102	$46/$28	$25/$13
Downtown Los Angeles - San Diego	$135/$79	$43/$26	$14/$7
Bakersfield - Sacramento	$189/$108	$42/$25	$32/$16
Burbank - San Jose	$86/$49	$48/$28	$37/$18
Sacramento - San Jose	$205/$124	$44/$26	$14/$7

* Notes: The sample costs include fares as well as parking, taxi fares and other costs involved in traveling to or from the station or airport. These costs reflect *averages*. The actual cost paid by any particular traveler will depend on the exact origin and destination of his trip. Also note that actual ridership calculations were made on a highly detailed basis, accounting for different travel times and costs in numerous geographic zones and then summarizing the results.

Table 3.6
Sample Total Trip Costs by Mode for Selected City Pairs ($1999)

Average Business Fare (ONE WAY)	Average Non-Business Fare (ONE WAY)	CITY PAIR
$42	$24	Downtown Los Angeles - Downtown San Francisco
$33	$18	Merced - Downtown San Francisco
$35	$20	Fresno - Downtown Los Angeles
$32	$18	Downtown Los Angeles - San Diego
$37	$21	Bakersfield - Sacramento
$40	$22	Burbank - San Jose
$35	$20	Sacramento - San Jose

Table 3.5
Sample High-Speed Train Fares ($1999)

With respect to revenue assumptions used in the financial plan, the experience of foreign high-speed rail systems shows that actual usage will be less than projected in the first years of service as people become aware of the new transportation system. The financial plan therefore assumes 85 percent of the projected ridership and revenue in the first year (2017), 95 percent in the second year (2018), and 100 percent in 2019 and beyond.

Potential for Long-Distance Commute Traffic

While the Authority's mandate is to serve the intercity travel market, the alignment of the system would also serve some important long-distance commute sheds in the San Francisco, Los Angeles, and San Diego regions, as shown on *Figure 3.7*. High-speed intercity trains would carry a portion of these longer-distance, interregional commuter passengers. Commuters make trips on a daily or near-daily basis.

The high-speed train system will generate surplus revenue with fares significantly lower than current airfares.

Figure 3.7
Express Commute Corridors

Because commuters choose their means of travel in a different manner than intercity travelers (e.g., commuters typically value their time less than intercity travelers), separate forecasts were made for commute traffic on the high-speed train system. The commuter forecasts where made using the regional travel demand models developed and maintained by agencies responsible for transportation planning in the San Francisco, Los Angeles, and San Diego regions.

Commuter Service and Fare Assumptions

Commuter service would be largely provided on the local and suburban express trains serving the intercity market, making stops at all high-speed train stations within and near each metropolitan area. Commuter service would be provided on four trains per hour at each station during the three-hour morning and afternoon peak periods. During off-peak periods, the commuter train frequency would be one train per hour. The fare structure assumed for commuter trips would be based on a $5.00 boarding charge plus 6.2 cents per mile. The resulting fares are somewhat higher than most commuter rail services now operating in California, reflecting the higher quality of service provided.

Forecasts of Commuter Patronage and Revenue

Table 3.7 shows the projected annual and daily ridership as well as annual revenue for commuter trips on the high-speed system for 2020. Commuter rail ridership is normally very downtown-oriented and sensitive to the ease and cost of automobile parking as well as highway congestion. The projected commuter ridership is not insignificant; with almost 10 million passengers, commuter ridership would be about 23 percent of the total ridership. Millions of commuters would be brought quickly and efficiently

Millions of commuters would be brought quickly and efficiently to the city-centers of San Francisco, San Jose, Los Angeles and San Diego each year by high-speed trains.

to the city-centers of San Francisco, San Jose, Los Angeles, and San Diego each year by high-speed trains. However, even though the ridership is impressive, commuter trips are much shorter than intercity trips and the revenue yielded per rider is lower than for intercity trips (about $6-11 versus $30-40 for intercity travel). Thus, the $70 million projected commuter revenue is less than 8 percent of the total intercity passenger revenue.

Nonetheless, with the annual cost of serving commuter patrons estimated at $51 million[2], commuters using the high-speed train service would generate a modest operating surplus. Moreover, utilizing the high capacity of the system, the number of commuters riding high-speed trains would continue to grow throughout the 21st century. In contrast, the major highways serving California's largest city-centers are already at capacity during peak periods, and environmental constraints largely restrict future expansion of these facilities. Providing high-speed train service for commuters would utilize the high-speed infrastructure more efficiently and greatly improve mobility in highly congested commute corridors, increasing the public benefits of and broadening the base of support for the system.

REGION	RIDERSHIP Daily (THOUSANDS)	Annual (MILLIONS)	Annual Revenue (MILLIONS $1999)
San Diego	0.9	0.2	$1
LAUS - Temecula	14.2	3.5	$28
LAUS - Santa Clarita	10.5	2.6	$17
San Francisco	11.9	3.3	$23
Total	37.5	9.6	$69

Table 3.7
Summary of Year 2020 Ridership and Revenue for Express Commuter Service

3.3 Sensitivity Analyses

The ridership and revenue forecasts used in the financial plan incorporate a number of assumptions regarding airfares, air and automobile travel times, and the projected growth in air and auto travel. To test the sensitivity of the forecasts to these variables, the Authority commissioned the following series of additional analyses using alternative assumptions.

Scenario 1: Increased Air and Auto Growth Rates. The investment quality forecasts used for the funding scenario assume annual growth rates for air and auto travel of 2.5 and 1.3 percent, respectively. These baseline growth rates resulted from econometric models developed and applied as part of the ridership forecasting process. These growth rates are lower than the rates used by some planning agencies and authorities. Therefore, sensitivity analyses were done to test the impact of higher rates of growth. A rate of 3.5 percent was applied for air transportation; a figure used in the past by the Federal Aviation Administration (FAA) for national aviation growth forecasts. An annual growth rate of 2.0 percent was used for auto, reflecting the rate used by the Federal Highway Administration as the long-term growth rate for all highway travel.

Scenario 2: Longer In-Flight Travel Times for Air. The financial plan ridership forecasts for 2020 assume that air travel times stay the same as today. However, increased delays at California's major hub airports are already noticeably getting worse. The Authority believes it is a likely prospect that by 2020, flight times within California will significantly increase. Therefore, under this sensitivity analysis, 15 minutes are added to each end of trips that would use the Los Angeles International (LAX), San Francisco International (SFO), or San Diego airports. For example, a trip between LAX and SFO would take a half hour longer while a trip from LAX to Oakland airport would require an additional 15 minutes. These increased air travel times would make air transportation less attractive relative to other modes, including high-speed trains.

Scenario 3: Longer Auto Travel Times. The auto travel times used in the financial plan forecasts are taken from networks used by regional planning agencies throughout the state. Peak hour factors were applied to travel times within urban areas when analyzing business travel. However, highway congestion may be worse than expected if, for example, programmed improvements are not built or do not have the expected effect. The Authority believes that the highway travel times used to project high-speed train ridership, tend to be optimistic even considering today's highway congestion in California. For example, the average 2020 auto time between downtown Los Angeles and downtown San Diego is forecast to be 2 hours and 19 minutes, and 2 hours 10 minutes between Sacramento and San Jose. Therefore, the Authority commissioned a sensitivity

[2] This figure includes $31.9 million additional operating costs and $19.5 million in annualized capital costs.

Case	Annual Ridership (MILLIONS)	Annual Revenue (MILLIONS, $1999)	% Change in Ridership	% Change in Revenue
Base forecast	32.0	888	N/A	N/A
1. Annual air/auto growth at 3.5%/2.0%	40.2	1,127	+26	+27
2. Air travel time +15 min at SAN, SFO, LAX	32.9	920	+3	+4
3. Auto travel time +30 min in LA, Bay Area	35.1	970	+10	+9
4. a) Air fares +50%	37.7	1,087	+18	+22
b) Air fares +100%	41.2	1,210	+29	+36
c) Air fares +150%	42.7	1,261	+33	+42
5. a) Combination of 2, 3 and 4a	41.5	1,196	+30	+35
b) Combination of 2, 3 and 4c	45.9	1,348	+43	+52
c) Combination of 1, 2, 3 and 4a	52.5	1,529	+64	+72
d) Combination of 1, 2, 3 and 4c	58.4	1,733	+83	+95

Table 3.8
Ridership and Revenue Sensitivity Analyses

analysis to investigate the impacts of longer automobile travel times on high-speed train ridership and revenue. This scenario adds one half hour to all auto trips to, from, or through the Los Angeles and Bay Area regions. For example, a trip between Los Angeles and San Francisco would require an additional hour while a trip from Sacramento to San Diego would require just an additional half-hour. These increased auto travel times would make highway transportation less attractive relative to other modes, including high-speed trains.

Scenarios 4a, 4b, and 4c: Increased Airfares. The financial plan forecasts assume that airfares in California remain at recently observed levels. While airlines might engage in temporary price-cutting fare wars, airfares are at historically low levels. However, airfares may increase in response to higher demand, more costly fuel, or other factors. Airfares within California are among the lowest in the country and perhaps the world. As a frame of reference, air travelers within the Northeast Corridor (Boston — New York — Washington, D.C.) currently pay well over twice the fares that air travelers do between California's major metropolitan areas. Therefore, additional sensitivity analyses were done testing the impacts on high-speed train ridership and revenue if the cost of traveling by air transportation within California were to increase. Under these scenarios, airfares are assumed to increase across the board by a) 50 percent; b) 100 percent; and c) 150 percent from current levels. Such increased airfares would make air transportation less attractive relative to other modes, including high-speed trains.

Scenarios 5a, 5b, 5c, and 5d: Combination Scenarios. These scenarios are combinations of all of the above level of service changes for competing modes, combining the increased air and auto growth rates and/or travel times with increases in airfares.

As shown in *Table 3.8*, high-speed train ridership is most sensitive to increases in airfares and the assumed rates of growth for the intercity travel market. The higher airfares result in ridership forecasts of between 18 and 34 percent over the baseline used in the financial plan. Additional increases would result if increased airfares were combined with increased air and auto growth rates and travel times. By comparison, increased air or auto travel times alone would have a modest impact on high-speed train ridership. The sensitivity of revenue follows a similar pattern. However, because passengers diverted from air tend to pay higher fares, the high-speed train revenue increases more rapidly than ridership with higher airfares.